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# USSR Report

PHYSICS AND MATHEMATICS



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9 January 1985

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PHYSICS AND MATHEMATICS**

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ACOUSTICS

UDC 534.231

PROBLEM OF FREQUENCY SPACE VARIATION OF SONIC FIELD IN STRATIFIED MEDIA

Moscow AKUSTICHESKIY ZHURNAL in Russian Vol 30, No 4, Jul-Aug 84  
(manuscript received 25 Jul 82) pp 490-494

IVANOVA, G. K., Institute of Applied Physics, USSR Academy of Sciences

[Abstract] A study was made of the frequency space distribution of a sonic field. An analytic description of the lines of maximum values of the square of sound pressure on the plane of frequency versus distance to source is presented. An equation was derived which yields an expression for the slope of the line through the parameters of the interference structure for all mode numbers. The equations for the lines of interference maxima here presented can be used to determine the nature of dispersion in actual stratified media by empirical selection of an analytic expression for the lines of the interference structure. The slope of the line allows determination of the difference in propagation times of mode and measurement of this difference if the interference wavelength is known. Figures 2; references: 13 Russian.  
[432-6508]

UDC 534.614

INFLUENCE OF PRESSURE ON SPEED OF SOUND IN SINGLE-PHASE REGION OF STRATIFYING MIXTURES

Tomsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: FIZIKA in Russian Vol 27, No 6, Jun 84 (manuscript received 14 Apr 83) pp 120-121

BAKLAGIN, A. S., DMITRIYEV, S. P. and SOKOLOV, V. V., All-Union Correspondence Machine Building Institute

[Abstract] The miscibility of the components of binary liquid systems under high pressure was investigated. The objects studied were mixtures with high critical stratification temperatures: nitrobenzol-n-hexane and aniline-cyclohexane. The velocity and coefficient of absorption of ultrasonic waves, shift viscosity and density were measured using an experimental setup described elsewhere. The speed of sound was investigated as a function of pressure and the composition of the mixtures. The density is found to be a monotonic function of the composition of the mixture. Figures 2; references 3: 2 Russian, 1 Western.  
[423-6900]

UDC 534.874.3

GENERATION OF SOUND BY A VORTEX POINT IN A STEADY FLOW OF SLIGHTLY COMPRESSIBLE FLUID

Moscow AKUSTICHESKIY ZHURNAL in Russian Vol 30, No 4, Jul-Aug 84  
(manuscript received 21 Feb 83) pp 502-506

KASOVA, S. G., Acoustics Institute imeni N. N. Andreyev, USSR Academy of Sciences

[Abstract] A study was made of the planar time-independent motion of a non-viscid, slightly compressible fluid along the X axis of a cartesian coordinate system. The problem of radiation of sound by a vortex point in the flow was solved assuming arbitrary curvature of flow lines in a certain limited area, yielding a power series in Mach numbers with coefficients which vary as a function of the Lagrangian coordinates of the vortex. Time-independent flow around a circular cylinder by an ideal slightly compressible fluid was studied as an example of application of the procedure. The radiation spectrum of the vortex point in the perturbed time-independent flow is a diverging cylindrical wave with dipole directivity along its axes. The dipole radiation coefficients are the Fourier transforms of the cartesian Lagrangian coordinates of the point in the flow where the vortex point is introduced. References 8: 5 Russian, 3 Western.

[432-6508]

UDC 534.222

ASYMPTOTIC COMPUTATION OF SOUND FIELDS IN THE OCEAN WITH DEPTH AND SURFACE WAVE GUIDES

Moscow AKUSTICHESKIY ZHURNAL in Russian Vol 30, No 4, Jul-Aug 84  
(manuscript received 7 Feb 83) pp 553-560

YAVOR, M. I., Leningrad State University imeni A. A. Zhdanov

[Abstract] A method is described for effective computation of sonic fields in stratified and horizontally heterogeneous underwater wave guides based on asymptotic formulas from the method of normal waves in the frequency range of 10 Hz to 1 KHz. The major requirements placed on the asymptotic computation algorithm are that the asymptotic equations be simple, particularly for the asymptotes of the dispersion equation, and at the same time the system of equations must not be too finely branched. Calculations were performed on a BESM-6 computer. Several examples of such calculations are presented with information describing the speed of the asymptotic program. Figures 6; references: 10 Russian.

[432-6508]

CRYSTALS AND SEMICONDUCTORS

UDC 621.315.592:534.28

PHONON-IMPURITY RELAXATION AND ACOUSTIC WAVE ABSORPTION IN YTTRIUM-ALUMINUM GARNET CRYSTALS WITH IMPURITIES

Leningrad FIZIKA TVERDOGO TELA in Russian Vol 26, No 3, Mar 84  
(manuscript received 24 Jun 83) pp 641-647

IVANOV, S. N., KOTELYANSKIY, I. M. and MEDVED', V. V., Institute of Electrical Engineering and Electronics, USSR Academy of Sciences

[Abstract] The contribution of scattering of thermal phonons on impurities in YAG to change in wave absorption and establishment of temperature relationships between the elastic and nonelastic relaxation times was investigated. It was found that the absorption of acoustic waves and YAG crystals containing rare-earth impurities is determined at certain temperatures by the scattering of thermal phonons on oscillations of the impurity atoms. Phonon-impurity relaxation processes have maximum influence on wave absorption, and are resonant in nature when the wave interacts with a group of thermal phonons at frequencies close to the oscillating frequencies of the impurity atoms. Investigation of wave absorption in pure YAG and YAG with impurities revealed a strong quantitative difference in the characteristic relaxation times for waves of different polarizations. Figures 4; references 27: 18 Russian, 9 Western.  
[414-6900]

UDC 535.341

ELECTRON-OSCILLATORY SPECTRA OF YTTRIUM-ERBIUM-ALUMINUM GARNET OF CRYSTALS AND THEIR ROLE IN LASER PUMPING

Leningrad FIZIKA TVERDOGO TELA in Russian Vol 26, No 5, May 84  
(manuscript received 1 Feb 84 after revision) pp 1537-1540

DZHEORDZHESKU, Sh., ZHEKOV, V. I., MURINA, T. M., POPOVA, M. N., and STUDENIKIN, M. I., Institute of General Physics, USSR Academy of Sciences, Moscow; Institute of Spectroscopy, USSR Academy of Sciences, Troitsk, Moscow Oblast

[Abstract] Pumping of an erbium laser with  $(Y_{1-x} Er_x) Al_5 O_{12}$  crystals was investigated. It was found that narrow electron lines in the spectra of

$(Y_{1-x} Er_x)_3 Al_5 O_{12}$  crystals are accompanied by comparatively weak electron-oscillatory tails which cover an extensive region of the spectrum. Electron-oscillatory transitions were compared with infrared spectroscopy and Raman scattering data, indicating that the extent of the electron-oscillatory transition region is the same as that of the oscillatory spectrum for  $(Y_{1-x} Er_x)_3 Al_5 O_{12}$  crystals, and that the many frequency differences between the electron lines and maxima in the electron-oscillatory tail coincide with the IR and Raman scattering active frequencies of the center of the Brillouin zone. Figures 2; references 8: Russian.  
[413-6900]

FLUID DYNAMICS

UDC 533.6.013.42:518.12

PARACHUTE INFLATION DYNAMICS

Moscow IZVESTIYA AKADEMII NAUK SSSR: MEKHANIKA TVERDOGO "ELA in Russian  
No 3, May-Jun 84 (manuscript received 24 Jun 83) pp 174-179

BELOTSERKOVSKIY, S. M., DNEPROV, I. V., PONOMAREV, A. T. and RYSEV, O. V.,  
Moscow

[Abstract] Parachute inflation was studied by synthesizing numerical methods of nonlinear aerodynamics and the theory of elasticity by computer, incorporating the joint integration of unsteady nonlinear aerodynamic equations and elastic equations. The detachment flow model was based on the schema of an ideal fluid and the discrete eddy method. The detachment point of the flow was assumed to be the edge of the entry opening of the parachute. The elastic formulas were integrated explicitly by the finite difference method. It was found that overloading during parachute inflation can be reduced significantly by reefing. The number of reefing phases and the values of the reefing parameters can be found through numerical analysis. Figures 5; references 8: 3 Russian, 5 Western.  
[419-6900]

UDC 537.84

PRE-TURBULENCE (TRANSITIONAL LAMINAR-TURBULENT FLOWS)

Riga MAGNITNAYA GIDRODINAMIKA in Russian No 2, Apr-Jun 84  
(manuscript received 1 Sep 83) pp 54-60

BERSHADSKIY, A. G.

[Abstract] The transition to turbulence during longitudinal flow about a flat plate in the presence of an initial turbulent background was investigated theoretically and experimentally, with allowance for random diffusion of liquid particles associated with the random nature of their movement. The influence of a magnetic field on the transition to turbulence in the boundary layer was investigated, indicating that a longitudinal magnetic field amplifies white noise in the flow region next to the wall. It was found experimentally that longitudinal velocity pulsation increases somewhat for small Hartman numbers. References 9: 8 Russian, 1 Western.  
[422-6900]

UDC 533.6.011.8

CHARACTERISTICS OF FLOW OF OSCILLATORY-RELAXING GAS IN NOZZLES WITH  
CONSTANT CROSS-SECTIONS IN THROAT REGION

Novosibirsk ZHURNAL PRIKLADNOY MEKHANIKI I TEKHNICHESKOY FIZIKI in Russian  
No 3, May-Jun 84 (manuscript received 17 May 83) pp 61-66

SAL'NIKOV, V. A., Moscow

[Abstract] A steady two-dimensional mixed sub- and supersonic flow of a non-viscous nonheat-conducting oscillatory-relaxing gas in flat compression-expansion nozzles having an area with a fixed cross section in the throat area and two bends in the contour at the beginning and end of the fixed area was investigated. The results were obtained by solving gas dynamic equations and relaxation kinetic equations simultaneously based on the approach used for the direct problem of the flow of gas in a Laval nozzle in the presence of non-equilibrium physico-chemical processes. When  $l_p > 2(l_p = L_p/(h_p/2))$ , where  $L_p$  is the length of the area with fixed-cross section of diameter  $h_p$  in the throat region, all of the oscillatory energy stored in the subsonic part of the nozzle is lost. Figures 4; references 16: 15 Russian, 1 Western.  
[426-6900]

UDC 532.517.4

FREQUENCY SPECTRA OF TURBULENT PULSATIONS IN STABILITY OF LAMINAR  
BOUNDARY LAYER

Minsk INZHENERNO-FIZICHESKIY ZHURNAL in Russian Vol 46, No 6, Jun 84  
pp 900-904

GRABOVSKIY, A. M. and SURKOV, S. V., Odessa

[Abstract] The characteristic frequencies of turbulent pulsations in a bounded flow of viscous liquid on a smooth plate were analyzed under the assumption that the growth and development of turbulent eddies are related to the pulsation field, and that the zone of quasi-ordered movement of the liquid is the same as the resonant zone. The assumption that turbulence is associated to resonant phenomena makes it possible to determine quite accurately the characteristic frequencies of turbulent pulsations and to explain the transition from laminar to turbulent movement. References 3: Russian.  
[421-6900]

LASERS AND MASERS

UDC 535.373+621.373.826

EXPERIMENTAL INVESTIGATION OF WAVEFRONT CONJUGATION DURING MANDELSTAM-BRILLOUIN SCATTERING OF FOCUSED LASER BEAMS IN CONDENSED MEDIA

Vilnius LITOVSKIY FIZICHESKIY SBORNIK in Russian Vol 24, No 2, Mar-Apr 84  
(manuscript received 17 Aug 82) pp 81-89

BAL'KYAVICHYUS, P. Y., DEMENT'YEV, A. S., LUKOSHYUS, Y. P., MALDUTIS, E. K.,  
and TARULIS, V. P., Institute of Physics, Lithuanian SSR Academy of Sciences

[Abstract] The effectiveness and quality of wavefront conjugation during stimulated Mandelstam-Brillouin scattering in acetone and optical glass was investigated as a function of the focusing conditions, spectral composition and pumping radiation powers greater than and less than the optical breakdown threshold power. It was found that when a system consisting of a spherical and cylindrical lamp is used for focusing, there is no reconstruction of the image of the wire mask in the range of powers investigated, regardless of whether a phase plate is used. The findings are important for developing short-pulse wavefront conjugation schemes, and for the use of wavefront conjugation in laser systems operating in the frequency mode. Figures 8; references 22: 20 Russian, 2 Western.

[443-6900]

EFFECT OF IMPURITIES ON ABSORPTION IN SEMICONDUCTORS AND LASING OF SEMICONDUCTOR LASERS

Moscow ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI in Russian Vol 87,  
No 1, Jul 84 (manuscript received 11 Jan 84) pp 135-142

YELESIN, V. F., Moscow Engineering-Physical Institute

[Abstract] The effect of impurity scattering of electrons on absorption in semiconductors and on laser operation was examined. It was shown that during combined electron-phonon and impurity scattering when the impurity scattering time is much shorter than the electron-phonon scattering time, the limiting

field increases by a factor of  $(\tau_{ph}/\tau_{im})^{1/2}$ . The behavior of the field as a

function of the pumping was found to be no longer monotonic when  $\beta$  is small. Combined scattering also broadens the form of the absorption curve, but to a lesser extent than previously assumed. Pure impurity scattering does not broaden the absorption line, meaning that any field remains strong.

References 8: 5 Russian, 3 Western.

[429-6900]

UDC 535.337:621.317.76.089.68

STUDY OF LIGHT SHIFTS IN LASER PUMPED QUANTUM DISCRIMINATOR FREQUENCY

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian  
Vol 27, No 6, Jun 84 (manuscript received 15 May 83) pp 705-708

BUDKIN, L. A., PENENKOV, M. N., PUKHTELEV, A. I. and PUZANOV, S. L.

[Abstract] An earlier work obtained equations for the light shifts in a quantum discriminator assuming that the excited states of the working atoms are mixed by collisions. This means that the contribution of the actual transitions of working atoms caused by pumping to the light shift of the frequency of the standard transmission need not be considered. This article assumes that this is true. Primary attention was given to computing the light shift under the most general assumptions concerning the spectral width of optical laser pumping. The results of the calculation were compared with experimental data in which a population inversion was achieved at the sublevels of superfine splitting using laser pumping of  $^{133}\text{Cs}$  atoms by the  $D_2$  line with wavelength 8521 Å. An experimental light shift dispersion curve was obtained on a model of the quantum discriminator with a cesium cell. The experimental and computed results agreed well qualitatively. More precise theoretical results require consideration of non-homogeneity of pumping light intensity over the length of the cell due to absorption within the cell. Figures 2; references 10: 6 Russian, 4 Western.

[433-6508]

UDC 535.37:621.378.3

SOLID STATE LUMINESCENT LIGHT FILTERS FOR NEODYMIUM LASERS

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 61, No 1, Jul 84  
(manuscript received 10 Mar 83) pp 43-48

VERENIK, V. N., KOPTEV, V. G., RAZVINA, T. M., RZHEVSKIY, M. B., STAVROV, A. A.  
and STAROSTINA, G. P.

[Abstract] The spectral-luminescent properties of a number of optical filters made of doped quartz glasses are compared; their influence on the lasing characteristics of a YAG:Nd<sup>3+</sup> laser are investigated. The studies employed KlZh5 glass, as well as quartz glass made of synthetic amorphous and crystalline silicon dioxide and containing Sm<sup>2+</sup>. Luminescence kinetics were investigated by using an Sl-70 oscilloscope. It is found that the use of quartz glasses doped with Sm<sup>2+</sup> ions and KlZh5 glass for light figures can increase the optical pumping efficiency of pulsed lasers in certain cases. References 16: 15 Russian, 1 Western.  
[436-6900]

UDC 621.375.8

CHARACTERISTICS OF UNSTABLE RESONATORS IN FLASHLAMP-PUMPED ORGANIC-COMPOUND LASERS

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 61, No 1, Jul 84  
(manuscript received 28 Mar 83) pp 28-33

ALEKSEYEV, V. A., TRINCHUK, B. F. and SHULENIN, A. V.

[Abstract] A symmetrical confocal resonator formed by two blind convex mirrors was investigated. The space-energy characteristics of radiation from a laser with an unstable resonator were investigated as a function of the specific pumping energy per cubic centimeter of active medium and the magnification of the resonator. Oscillograms of laser pulses were recorded in different cross sections of the laser beam, as were the lasing field patterns at various distances from the exit mirror of the resonator. The maximum spectral wavelengths of flat and unstable resonators were tabulated. It was found that the proper choice of parameters of an unstable resonator reduces laser beam divergence significantly and provides greater axial brightness of radiation than that provided by a flat resonator, even with a highly non-homogeneous active medium, making it possible to extend the capabilities of flashlamp-pumped organic-compound lasers. Figures 4; references 6: 4 Russian, 2 Western.  
[436-6900]

UDC 621.378.3

INFLUENCE OF STRUCTURE OF THIOPYRILOCYANIC DYES ON OUTPUT CHARACTERISTICS OF PASSIVE MODE-LOCKED LASER

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 61, No 1, Jul 84  
(manuscript received 4 May 83) pp 21-28

DEMCHUK, M. I., MIKHAYLOV, V. P., ISHCHEKO, A. A., KUDINOVA, M. A., TOLMACHEV, A. I. and YUMASHEV, K. V.

[Abstract] The influence of the structure of thiopyrilocyanic dyes on the output characteristics of lasers was investigated for use in passive shutters for mode locking in order to select a dye which provides good radiation parameters and to develop practical recommendations on the synthesis of new dyes to improve the parameters of passive mode-locked lasers. Symmetrical thiopyrilocyanic dyes and their analogs were investigated. The laser radiation parameters were studied on a setup employing an yttrium-aluminum garnet as the active element, with the dye solution held in contact with a rear spherical mirror 2500 mm in diameter. The laser radiation parameters were tabulated for a series of polymethane dyes with different molecular structures. The findings make it possible to synthesize optimal absorbers from available components. References 7: 6 Russian, 1 Western.  
[436-6900]

LASING CHARACTERISTICS OF YAG: Nd<sup>3+</sup>-LASER WITH LiF PASSIVE SHUTTER WITH  
F<sub>2</sub><sup>-</sup> COLOR CENTERS

Leningrad PIS'MA V ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 10, No 14,  
26 Jul 84 (manuscript received 18 Mar 84) pp 847-850

GRAFENSTEYN, S. G., IVANOV, N. A., INSHAKOV, D. V., PARFIANOVICH, I. A.,  
FOMICHEV, A. A., CHEPURNOY, V. A. and YAKSHIN, M. A.

[Abstract] Lasing was obtained at 1111.2, 1115.95 and 1122.5 nm in a YAG:Nd<sup>3+</sup> laser with an LiF shutter with F<sub>2</sub><sup>-</sup> color centers. The experiments were conducted in a plane-parallel resonator with mirrors having respective coefficients of reflection in the 1000-1200 nm band of 100 and 60%. The active element was 65 x 4 mm and was pumped by an ISP-2500 impulse lamp. The shutter was an LiF crystal subjected to  $\gamma$ -radiation at T=50 K with F<sub>2</sub><sup>-</sup> centers. The shutter served as a selective amplifier within the cavity and promotes a drop in the lasing threshold on weak  $^4F_{3/2} \rightarrow ^4J_{11/2}$  in Nd<sup>3+</sup>. The radiation energy was increased by amplification through effective nonlinear conversion of the radiation frequencies on the Li<sub>2</sub>SiO<sub>3</sub> crystal, making it possible to expand the tuning range of neodymium garnet lasers in the visible and near-infrared regions of the spectrum. Figures 2; references 4: 3 Russian, 1 Western.  
[447-6900]

UDC 621.373.826

DISTORTION OF TEMPORAL CHARACTERISTICS DURING PARAMETRIC UP-CONVERSION  
OF ULTRASHORT LASER PULSES

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 7, Jul 84  
(manuscript received 1 Sep 83) pp 1348-1352

GANDEL'MAN, G. M., ITSKOVICH, O. Yu., KONDRAHENKO, P. S., SOBOLEV, S. S.,  
STEPANOV, B. M. and CHALKIN, S. F., All-Union Scientific Research Institute  
for Optical-Physical Measurements

[Abstract] Distortion of the temporal behavior of IR pulses during parametric up-conversion was examined. The field behavior at the combined frequency was determined as a function of the fields at frequencies mixed in a nonlinear medium which holds for signals with durations of  $10^{-10}$ - $10^{-12}$  seconds. Three methods for recovering the form of the temporal behavior of IR pulses based on parametric up-conversion were analyzed. References 4: 1 Russian, 3 Western.  
[441-6900]

UDC 621.373.826.038.825.2

STABILITY OF TEMPORAL AND ENERGY PARAMETERS OF PICOSECOND LANTHANUM  
BERYLLATE LASER

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 7, Jul 84  
(manuscript received 27 Oct 83) pp 1487-1490

PISKARSKAS, A., SIRUTKAYTIS, V., YUOZAPAVICHYUS, A. and YANKAUSKAS, A.,  
Vil'nyus State University imeni P. Kapsukas

[Abstract] The stability of the energy and temporal parameters of a passive mode-locked  $\text{La}_2\text{Be}_2\text{O}_5:\text{Nd}$  laser employing two-threshold operation was investigated. Maximum pulse lengths of approximately 7 nsec were obtained with energy stability characteristic of analogous YAG:Nd lasers. The amplification of picosecond pulses in an  $\text{La}_2\text{Be}_2\text{O}_5:\text{Nd}$  laser was investigated. An  $\text{La}_2\text{Be}_2\text{O}_5:\text{Nd}$  laser was employed to initiate a synchronous pumped parametric oscillator.  
Figures 3; references 6: 3 Russian, 3 Western.  
[441-6900]

UDC 621.373.8

AUTOSTOCHASTIC BEHAVIOR OF SOLID STATE RING LASER WITH LOW FREQUENCY  
PERIODIC LOSS MODULATION

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 7, Jul 84  
(manuscript received 13 Oct 83) pp 1483-1487

KHANDOKHIN, P. A. and KHANIN, Ya. I., Institute of Applied Physics, USSR  
Academy of Sciences, Gorky

[Abstract] A solid state traveling-wave YAG neodymium ring laser employing sinusoidal loss modulation was investigated experimentally. It was found that increasing the percentage of loss modulation of the fixed frequency leads initially to nonlinear distortions of the laser response, followed by an abrupt transition to the pulse mode with a pulse repetition frequency equal to the loss modulation frequency. Increasing the modulation percentage further complicates the lasing pattern, leading to bifurcation increase in the period and finally to a mode with randomly varying amplitude and pulse repetition interval. The laser response was found to be a hysteresis function of the modulation percentage. The experimental findings agreed well with the results obtained through numerical solution of the equations for a solid state ring laser. Figures 4; references 11: 8 Russian, 3 Western.  
[441-6900]

UDC 621.373.826.038.824

INVESTIGATION OF DYE LASERS PUMPED BY HIGH-POWER KrF LASER RADIATION

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 7, Jul 84  
(manuscript received 3 Oct 83) pp 1389-1393

KLEMENTOV, A. D., MOROZOV, N. V. and SERGEYEV, P. B., Physics Institute imeni N. P. Lebedev, USSR Academy of Sciences

[Abstract] The lasing characteristics of ethanol solutions of rhodamine R6Zh, coumarin K47, PTP and POPOP dyes excited by radiation from a KrF-laser at approximately 10 J with pulse lengths of approximately 80 nsec were investigated. Lasing energy of approximately 1.1 J with efficiency of approximately 14% was obtained for R6Zh and K47 solutions; the energy for PTP was 0.65 J, with efficiency of approximately 8%; the respective figures for POPOP were 0.3 J and 5%. The advantages and disadvantages of a number of dye laser cells designed to be pumped by high-power excimer lasers were investigated experimentally. Figures 5; references 16: 7 Russian, 9 Western.  
[441-6900]

UDC 621.373.826.038.823

SATURATION KINETICS OF ACTIVE MEDIUM OF OXYGEN-IODINE LASER

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 7, Jul 84  
(manuscript received 22 Sep 83) pp 1379-1389

ZAGIDULLIN, M. V., IGOSHIN, V. I. and KUPRIYANOV, N. L., Kuybyshev Branch, Physics Institute imeni P. N. Lebedev, USSR Academy of Sciences

[Abstract] The saturated gain in an oxygen-iodine medium was determined as a function of the intensity of the applied field and the kinetic contacts of the elementary processes, making it possible to find the saturation intensity and to estimate the characteristic intra-resonator intensity. The spectral-energy characteristics of chemical oxygen-iodine lasers were studied under conditions of irregular broadening and finite relaxation rates. The basic processes determining the field saturation kinetics are the exchange of the electron energy of atomic iodine with molecular oxygen, translational iodine atom relaxation, Van Der Waals mixing of  $^2P_{3/2}$  sublevels and mixing of  $^2P_{1/2}$  sublevels during exchange interaction with oxygen molecules. Translational and superfine relaxation processes were shown to play an exceptionally important role in the formation of the lasing spectrum. The influence of anomalous dispersion effects on divergence of laser radiation in the multimode lasing condition is discussed. The finite translational relaxation rate reduces the output power of the laser severalfold, and increases the length of the lasing zone. Figures 5; references 22: 8 Russian, 14 Western.  
[441-6900]

MOLECULAR PHYSICS

UDC 621.373.826.038.823

ABSORPTION OF OZONE MOLECULES IN STRONG FIELD OF TEA CO<sub>2</sub> INJECTION LASER

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 7, Jul 84  
(manuscript received 19 Sep 83) pp 1357-1363

DZHIDZHOYEV, M. S., POPOV, V. K., PLATONENKO, V. T. and CHUGUNOV, A. V.,  
Moscow State University imeni M. V. Lomonosov

[Abstract] The relationship between the IR radiation energy absorbed by ozone and the energy density was investigated at pressures at which collisions have a significant influence on the energy absorption mechanism but do not cause transitions between the oscillatory levels over time intervals equal to the light pulse duration. A radiation-injection stabilized TEA CO<sub>2</sub> laser was employed as the radiation source. The results obtained with and without injection were compared, indicating that the energy absorbed by the medium is proportional to the square root of the energy density for densities ranging from 10<sup>-3</sup> to 320 J/cm<sup>2</sup>. Collision-mode absorption of intense radiation is examined theoretically, showing qualitative agreement with the experimental findings. Figures 3; references 16: 6 Russian, 10 Western.  
[441-6900]

UDC 535+534.222+539.196

NUMERICAL INVESTIGATION OF PROPAGATION OF RADIATION PULSE AT  $\lambda=10.6 \mu\text{m}$  THROUGH ABSORBING MEDIA

Novosibirsk ZHURNAL PRIKLADNOY MEKHANIKI I TEKHNICHESKOY FIZIKI in Russian  
No 3, May-Jun 84 (manuscript received 24 May 84) pp 14-19

LEVIN, V. A., NETESOV, V. V. and STARIK, A. M., Moscow

[Abstract] The propagation of a radiation pulse at  $\lambda=10.6 \mu\text{m}$  through an absorbing medium was investigated. The influence of saturation and nonlinear processes of oscillatory energy exchange on the self-stress of light beams with Gaussian profile was studied. A theoretical model was derived and illustrated. The analysis indicates that allowance must be made for the excitation of various types of oscillations of the molecules of the mixture and the finite thermalization rate of the absorbed energy, as well as saturation of the absorbing transition, for a radiation pulse propagating in gaseous

resonant absorbing media. Failure to take these effects into account can result in substantial errors in determining the amplitude-phase characteristics of a light beam. Figures 5; references 19: 13 Russian, 6 Western.  
[426-6900]

UDC 543.544:621.593

#### DIFFUSION SEPARATION OF REACTING GAS MIXTURES

Minsk INZHENERNO-FIZICHESKIY ZHURNAL in Russian Vol 46, No 6, Jun 84  
(manuscript received 31 Mar 83) pp 922-930

BUYEVICH, Yu. A. and KIRNOS, I. V., Ural State University, All-Union Scientific Research Institute for Metallurgical Heat Engineering

[Abstract] The problem of extracting a component of a chemically reactive gas mixture via selective diffusion through a semipermeable membrane was considered. A steady separation process in elementary cells with one inlet channel and one outlet channel was examined. The separation rate depends upon the mixing rates in the inlet channel and the rate of transfer to the surface of the wall, the adsorption and dissolving of gas in the wall material, the diffusion of gas in the solid solution, its desorption in the outlet channel and flow through the ladder. Material balance equations for molar flows of reagents and reaction products in the inlet channel were derived. A numerical example of a dissociation reaction is presented. Inaccuracies in the traditional description of mass-exchange processes are discussed in an appendix.

References 8: 6 Russian, 2 Western.

[421-6900]

UDC 534.529

#### DETERMINATION OF GAS DIFFUSION COEFFICIENT IN SEA WATER BY DISSOLUTION OF AIR BUBBLES

Moscow AKUSTICHESKIY ZHURNAL in Russian Vol 30, No 4, Jul-Aug 84  
(manuscript received 3 Feb 83) pp 455-459

GONCHAROV, V. K., KUZNETSOVA, S. N., NEUIMIN, G. G. (deceased) and SOROKINA, N. A., Marine Hydrophysics Institute, Ukrainian Academy of Sciences

[Abstract] An apparatus consisting of a vertical pipe section sealed at both ends with the upper cover made of flat glass was used in studies of the gas diffusion coefficient in sea water. Three collimator light sources illuminated the glass cover. The device was rapidly immersed in water, forming air bubbles of various sizes, the covers were immediately closed and bubbles rose and settled on the bottom surface of the glass cover. The instrument was then immersed to a predetermined depth and the bubbles photographed at predetermined time intervals to determine the rate of dissolution. Equations are presented

which can be used to determine the diffusion coefficient from the photographic data. The diffusion coefficient was found to vary broadly: from  $3.67 \cdot 10^{11}$  to  $4.46 \cdot 10^{-10} m^2 s^{-1}$ . Figures 3; references 4: 3 Russian, 1 Western.  
[432-6508]

UDC 543.42

DECAY OF MOLECULAR CHAINS DURING NON-RESONANT INTERACTION BETWEEN A POLYMER AND OPTICAL RADIATION

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 61, No 1, Jul 84  
(manuscript received 16 Feb 83) pp 125-128

VETTEGREN', V. I. YERON'KO, S. B., YEREMEYeva, Ye. P., OVCHINNIKOV, V. M., SMIRNOV, Z. A. and CHMEL', A. Ye.

[Abstract] The structural evolution of a polystyrene polymer chain caused by nonresonant interaction of the material with laser radiation was investigated in order to identify the features of the change in polymer molecular structure resulting from subthreshold impulse energy density. Infrared spectroscopy and Raman spectroscopy were employed to investigate structural changes. The concentration of conformational "defects", as well as the concentration of macromolecular chain disruptions, are found to be higher in irradiated specimens. References 8: 6 Russian, 2 Western.  
[436-6900]

## OPTICS AND SPECTROSCOPY

### SPONTANEOUS DIFFRACTION OF SEQUENCE OF SUPERSHORT LIGHT PULSES IN DYE SOLUTION

Leningrad PIS'MA V ZHURNAL TEKHNICHESKOY FIZIKI in Russian Vol 10, No 13, 12 Jul 84 (manuscript received 30 May 84 after revision) pp 816-820

AL'TSHULER, G. B., BELASHENKOV, N. R., KARASEV, V. B., KOZLOV, S. A., KRYLOV, K. I. and OKISHEV, A. V., Leningrad Institute of Precision Mechanics and Optics

[Abstract] A new effect associated with the transmission of laser beams through nonlinear media is described in which the scattered light radiation develops an annular structure: spontaneous diffraction of a train of supershort laser pulses in a weakly absorbing medium. The structure of the scattered radiation remains annular as the transmission intensity distribution in the laser beam is varied. The spontaneous diffraction of supershort light pulses is of fundamental importance for understanding the nature of the formation of annular scattering structure during the transmission of light through weakly absorbing media. Scattering of light with spontaneous diffraction of light pulse trains may be one of the mechanisms underlying the restriction of the brightness of mode-locked lasers. Figures 2; references 9: 7 Russian, 2 Western.  
[449-6900]

UDC 621.373.826

### FOUR-WAVE HYPERSONIC REVERSING MIRRORS IN SATURATION MODE

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 7, Jul 84 (manuscript received 27 Sep 83) pp 1476-1479

ANDREYEV, N. F., BESPAЛОV, V. I., DVORETSKIY, M. A. and PASMANIK, G. A., Institute of Applied Physics, USSR Academy of Sciences, Gorky

[Abstract] Wave front conjugation based on four-wave interaction of light with hypersound was investigated in which the seed source for the development of instability is either the optical signal subjected to wave front conjugation, or spontaneous scattering of the pumping wave on thermal noise of the medium. The low thermal noise level makes it possible to transform the pumping wave energy efficiently through an inverted wave when the input signal is relatively

weak. Signals with energy of  $10^{-4}$  J were subjected to wave front conjugation by pumping pulses with energy of 5 J and duration of 30 nsec, with conversion of 1 J to the reversed wave and reduction of the pulse duration to 10 nsec. Figures 3; references 5: Russian.  
[441-6900]

UDC 621.376

OPTIMIZATION OF PIEZOCERAMIC OPTICAL DEFLECTOR

Minsk DOKLADY AKADEMII NAUK BSSR in Russian Vol 28, No 8, Aug 84  
(manuscript received 22 Mar 83) pp 709-712

SHIROKOV, A. M., corresponding member, Belorussian SSR Academy of Sciences,  
LEONOV, A. M. and SHULYAK, V. V., Institute of Technical Cybernetics,  
Belorussian SSR Academy of Sciences, Belorussian State University imeni  
V. I. Lenin

[Abstract] The optimum geometric parameters of a trapezoidal piezoceramic deflector were defined with respect to the maximum speed criterion. The deflector consisted of a cantilevered piezo drive with a mirror secured to its free end. The geometric parameters to be optimized were the length and thickness of the drive, as well as the distance along the axis from the end of the drive to the center of gravity of the mirror. It was found that the coefficient characterizing the speed of the deflector increased by 24% when the reflectivity was changed from 0 to 0.5. The main factor underlying the increase in deflector speed is increased thickness of the piezo drive at its attachment point. Figures 1; references 5: Russian.

[439-6900]

PLASMA PHYSICS

UDC 621.375.826:621.039.64

CALORIMETRIC MEASUREMENTS OF ENERGY BALANCE OF LASER RADIATION DURING HEATING OF SPHERICAL TARGETS ON DEL'FIN-1 INSTALLATION

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 7, Jul 84  
(manuscript received 1 Jun 83 after revision) by 1313-1318

VASIN, B. L., DANILOV, A. Ye., KALASHNIKOV, M. P., MIKHAYLOV, Yu. A., ORLOV, V. V., RODE, A. V., SKLIZKOV, G. V., FEDOTOV, S. I., TSVETKOV, M. Yu., and SHISHKINA, L. I., Physics Institute imeni P. N. Lebedev, USSR Academy of Sciences

[Abstract] Experiments on the Del'fin-1 multichannel laser installation are described in which the energy balance, laser radiation scattering and anisotropy of plasma expansion were studied during heating of spherical targets with incident energy ranging from 0.1 to 1 kJ. It was found that the combined radiant energy reflected into the aperture of the focusing optics and the energy passing through and past the target comprise no more than 10-20% of the total energy balance, and that the relationship between them depends upon the target material and construction. The efficiency of laser radiation absorption by targets with high aspect ratios that are 300  $\mu\text{m}$  and greater in diameter is 40-45%. Target irradiation irregularity, heating irregularity and plasma scattering was found to be correlated. Figures 6; references 10: 6 Russian, 4 Western.  
[441-6900]

UDC 621.039.6

NUMERICAL ANALYSIS OF THERMONUCLEAR DETONATION IN DENSE PLASMA

Moscow FIZIKA PLAZMY in Russian Vol 10, No 3, May-Jun 84  
(manuscript received 11 Nov 82 after revision) pp 514-521

AVRONIN, Ye. N., BUNATYAN, A. A. (deceased), GADZHIYEV, A. D., MUSTAFIN, K. A., NURBAKOV, A. Sh., PISAREV, V. N., FEOKTISTOV, L. P., FROLOV, V. D. and SHIBARSHOV, L. I., Institute of Atomic Energy imeni I. V. Kurchatov, Chelyabinsk State University

[Abstract] The propagation of thermonuclear combustion from the region heated to thermonuclear temperatures by an external source to the remaining part of the target was investigated. The target was a tube of inert material

(gold, lead, beryllium, etc.) filled with a deuterium-tritium mixture. It was determined analytically that thermonuclear combustion can propagate from a small portion of a nonspherical target to the remainder of the target and that a steady-state thermonuclear detonation wave can be formed. The role of various physical processes in thermonuclear detonation was investigated. Shock wave is the main mechanism underlying detonation propagation. The detonation rate and intensity of the thermonuclear reaction is influenced by the leakage of heat due to transverse heat conductivity. The critical diameter for thermonuclear detonation was determined approximately for a plasma filament encased in a housing with twice the density of the "fuel". Figures 6; references 8: 4 Russian, 4 Western.  
[416-6900]

UDC 533.915.03:621.378.324

PLASMA STATES NEAR SURFACE OF METAL IRRADIATED BY CO<sub>2</sub> LASER

Moscow FIZIKA PLAZMY in Russian Vol 10, No 2, Mar-Apr 84  
(manuscript received 15 Mar 83) pp 385-391

DAN'SHCHIKOV, Ye. V., LEBEDEV, F. V. and RYAZANOV, A. V., Institute of Atomic Energy imeni I. V. Kurchatov

[Abstract] The conditions for the occurrence and maintenance of plasma in different states, and the influence of a plasma on the transmission of laser radiation to the targets, were investigated. The plasma was created by quasi-steady radiation from a CO<sub>2</sub> laser producing fixed power of 0.5-10 kW for periods of 0.5-1 msec focused on the surface of a titanium target in a spot 0.6 mm in diameter. Qualitatively different states of the plasma near the surface were identified from the plasma radiation spectra. The discharge plasma in metal vapors can increase the amount of laser power absorbed by the target, while an optical discharge in gas has a negative influence on the local action of the laser radiation on the target. The state diagrams obtained for the plasma near the surface are helpful for selecting modes and predicting processing conditions. Figures 4; references 19: 15 Russian, 4 Western.  
[415-6900]

UDC 533.92

EXCITATION OF IMPURITIES BY HEAVY PARTICLES AND RADIATIVE LOSSES OF THERMONUCLEAR PLASMA

Moscow FIZIKA PLAZMY in Russian Vol 10, No 2, Mar-Apr 84  
(manuscript received 21 Feb 83) pp 400-406

ABRAMOV, V. A., GONTIS, V. G. and LISITSA, V. S., Institute of Atomic Energy imeni I. V. Kurchatov

[Abstract] The role of excitation of impurities by heavy particles and their contribution to thermonuclear plasma radiative losses were analyzed. Excitation losses of multiply-charged impurity ions in a hot plasma was found to be a new direct heavy particle energy loss channel. The radiant energy losses due to excitation by heavy particles in a strongly nonequilibrium plasma was found to be comparable with the corresponding electron losses. The effects observed can influence the energy balance of the fundamental plasma ions as well as fast particles ( $\alpha$ -particles, or particles injected into the plasma to heat it). The absolute losses are determined to a significant extent by the excitation cross sections. The effects observed can play an important role in any plasma systems in which the ion temperature is significantly higher than the electron temperature. Figures 6; references 14: 10 Russian, 4 Western.

[415-6900]

UDC 533.951

EXPLOSIVE INSTABILITY OF STRONG ELECTROMAGNETIC WAVE IN PLASMA

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 6, Jun 84 (manuscript received 31 Oct 83 after revision) pp 697-704

DUBININA, Ye. A., URUSOVA, N. A. and FAYNSHTEYN, S. M., Gor'kiy Polytechnical Institute

[Abstract] An earlier work analyzed the possibility of development of explosive instability in a cold plasma in an HF field of a circularly polarized electromagnetic wave. Conditions of development and stabilization of the explosion were determined. For ultrarelativistic strong pumping, the movement of ions must be considered and the study of the generation of the wave upon development of explosive instability in a magnetically active plasma is of interest. This article studies the influence of both of these factors. Dispersion equations were obtained and analyzed for small oscillations, as well as equations for wave amplitudes. The possibility of development of explosive instability was determined and estimates of the explosion times for a laser plasma were obtained. Figures 2; references: 9 Russian.  
[433-6508]

INFLUENCE OF SHOCK WAVE FRONT ON NATURE OF LUMINESCENCE OF RECOMBINING  
LASER PLASMA

Moscow KVANTOVAYA ELEKTRONIKA in Russian Vol 11, No 7, Jul 84  
(manuscript received 10 Feb 83) pp 1332-1337

BOYKO, V. A., BRYUNETKIN, B. A., BUNKIN, F. V., DERZHNEV, V. I., DYAKIN, V. M.,  
MAYOROV, S. A., SKOBELEV, I. Yu., FAYENOV, A. Ya., FEDOSIMOV, A. I., SHJLOV,  
K. A. and YAKOVLENKO, S. I., Institute of General Physics, USSR Academy of  
Sciences

[Abstract] Space-time and spectral measurements were made of the radiation characteristics of a laser plasma interacting with a flat screen. The space-time measurements were used to construct the directivity pattern of the velocities of movement of the fastest component of the plasma, to find the rate of movement of the main mass of the plasma filament, to determine the rate at which the shock wave withdraws from the screen, and to estimate the propagation velocity of the electron heating "tongue". It was found through direct observation that the intensity of the continuous spectrum increases somewhat in the zone of conductive heating, where recombination pumping (and, accordingly, ion line luminescence) occur. It was found that the radiation characteristics of a laser plasma interacting with a solid state obstacle is determined by the structure of the shock wave front in the plasma. The fact that recombination population of levels intensifies in the shock wave density discontinuity can be used to amplify radiation on multiply-charged ion transitions. Figures 6; references 9: Russian.

[441-6900]

STRESS, STRAIN AND DEFORMATION

UDC 624.074+539.376:678.5.06

STABILITY OF VISCOELASTIC CONSTRUCTIONS SUBJECTED TO STEADY RANDOM  
COMPRESSING LOADS

Moscow IZVESTIYA AKADEMII NAUK SSSR: MEKHANIKA TVERDOGO TELA in Russian  
No 3, May-Jun 84 (manuscript received 17 Feb 82) pp 152-159

POTAPOV, V. D., Moscow

[Abstract] The method of averaging was employed to analyze the stability of stochastic viscoelastic constructions. The integrodifferential equations describing the shift of the construction was converted to differential equation form by the averaging procedure. The analysis indicated that increasing the dispersion of the random component of the load and reducing its correlation scale reduces the degree of stability, while increasing the creep of the material and reducing the relaxation time increases the degree of stability. Increasing the constant component and the dispersion of the random component and reducing the correlation scale of the load reduces the mathematical expectation and dispersion of the time  $t_{\infty}$ , while increasing the creep and the parameter  $\gamma$  increases these characteristics. References 9: Russian.  
[419-6900]

UDC 534.222

INCIDENCE OF OBLIQUE SHOCK WAVE ON HALF-SPACE OF DETONATING MEDIUM

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA: MATEMATIKA, MEKHANIKA in Russian  
No 4, Jul-Aug 84 (manuscript received 25 Nov 82) pp 49-52

ZVEREV, I. N., GENDUGOV, V. M. and ZINOV'YEV, A. S.

[Abstract] The interaction between an oblique shock wave incident from a neutral gas on the interface boundary with a detonating medium was investigated. All possible models of flow were examined for the case of an incident shock wave causing Chapman-Jouguet detonation in the half-space of the explosive; the conditions under which the models are realized were determined. The analysis was restricted to regular interaction in which the point of intersection of the incident shock wave and detonation wave lies on the boundary between the media. Figures 3; references 2: Russian.  
[425-6900]

WAVES DURING UNDERGROUND EXPLOSIONS

Novosibirsk ZHURNAL PRIKLADNOY MEKHANIKI I TEKHNICHESKOY FIZIKI in Russian  
No 3, May-Jun 84 (manuscript received 21 Apr 83) pp 34-41

KRYMSKIY, A. V. and LYAKHOV, G. M., Moscow

[Abstract] A model of a solid multicomponent medium was constructed that allows for plastic properties and the volumetric viscosity for nonlinear limiting compression patterns. A solution was obtained for the problem of the propagation of the spherical detonation wave created during an underground camouflet explosion. The maximum intensity, particle velocity, propagation rate of maximum stress, wave profiles at different distances from the site of the explosion and the radius of the camouflet cavity were determined. Comparison with results of experiments conducted in soil indicates good correspondence with all of the basic parameters of the wave. Figures 6; references 13: 12 Russian, 1 Western.

[426-6900]

THERMODYNAMICS

UDC 535.21

LASER HEATING OF WATER DROPLETS WITH SURFACE FILMS

Minsk ZHURNAL PRIKLADNOY SPEKTROSKOPII in Russian Vol 61, No 1, Jul 84  
(manuscript received 10 Mar 83) pp 33-39

PRISHIVALKO, A. P.

[Abstract] The characteristics of heat release within large droplets of water with surface films, and of droplet heating and thermal destruction caused by weakly absorbed high intensity monochromatic radiation, were investigated. Results were obtained for a water droplet with an initial radius of  $100 \mu\text{m}$  struck by radiation at a wavelength of  $2.36 \mu\text{m}$ . Absorption efficiency was analyzed as a function of the thickness of the surface layer for droplets with and without surface films. The cross-sectional temperature distribution was found to be practically independent of the thermophysical properties of the substance forming the film on the droplets. The features of the heating process and the development of the temperature field within droplets with and without films was determined by solving the two-dimensional heat convection problem for the case of optimum film thickness. Figures 4; references 11: Russian.

[436-6900]

MATHEMATICS

UDC 62-50

DOMAINS OF ATTAINABILITY FOR CERTAIN FEEDBACK SYSTEMS

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: MATEMATIKA, MEKHANIKA, ASTRONOMIYA in Russian Vol 13, No 3, Jul 84 (manuscript received 9 Sep 82) pp 39-48

POTAPOV, A. P.

[Abstract] Domains of attainability are constructed for certain specific feedback systems. It is shown that these domains may fail to coincide with the domains of attainability of the systems for the case of programmed control. The domains, furthermore, lack the properties of convexity and closedness characteristic of the domains of attainability of program-controlled linear systems. Figures 3; references 3: Russian.  
[444-6900]

UDC 502.3:519.26

CONSTRUCTION OF MATHEMATICAL MODELS OF RESPONSE OF BIOLOGICAL OBJECTS TO ENVIRONMENTAL POLLUTION FACTORS

Moscow METROLOGIYA in Russian No 3, Mar 84 pp 16-25

GENIATULIN, K. V. and ISAYEV, A. B.

[Abstract] The relationship between the response function of microorganisms and pollution factors was studied using graphic methods that permit the significant effects of those factors to be determined without resorting to traditional dispersion analysis. The use of one graphic method was illustrated by analyzing the influence of chemical environmental polluting factors (detergents, petroleum and cuprate). A mathematical model based on graphic data and the sign of the regression coefficients indicates that the response function is linearly related to factor  $X_1$  (detergent), and that the action of the other two factors ( $X_3$  and  $X_4$ ) is proportional to their interaction ( $X_3 X_4$ ). The graphic method significantly reduces the amount of labor required. Figures 1; references 11: 9 Russian, 2 Western.  
[424-6900]

UDC 519.7

EFFECTIVE METHOD FOR SYNTHESIS OF CORRECT RECOGNITION ALGORITHMS

Moscow ZHURNAL VYCHISLITEL'NOY MATEMATIKI I MATEMATICHESKOY FIZIKI in Russian  
Vol 24, No 7, Jul 84 (manuscript received 12 Nov 82) pp 1079-1086

ISAYEV, I. V., Moscow

[Abstract] An efficient method for synthesizing a correct recognition algorithm within the framework of the estimation computation model was presented. Construction of the correct algorithm in a form convenient for implementation was described. The recognition of objects in an unbounded sample was discussed. A set of points is identified for which the problem becomes a standard problem of recognizing a finite set of point objects with potentials. References 5: Russian.

[420-6900]

UDC 518.9

A DIFFERENTIAL SEARCH GAME

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: MATEMATIKA, MEKHANIKA,  
ASTRONOMIYA in Russian Vol 13, No 3, Jul 84 (manuscript received 8 Dec 83)  
pp 103-105

GARNAYEVA, G. Yu.

[Abstract] An antagonistic differential search game for a mobile object with incomplete information was examined by reduction to a dynamic game with complete information but with dependent moves. The existence of an equilibrium point was proved for the case of a single discriminated player. References 9: 6 Russian, 3 Western.

[444-6900]

UDC 62-50

FINITE ADAPTIVE SWITCHING ALGORITHM ENSURING DISSIPATIVE CONTROL SYSTEM  
FOR DYNAMIC OBJECT

Leningrad VESTNIK LENINGRADSKOGO UNIVERSITETA: MATEMATIKA, MEKHANIKA,  
ASTRONOMIYA in Russian Vol 13, No 3, Jul 84 (manuscript received 3 Nov 82)  
pp 54-60

TERTYCHNYY, V. Yu.

[Abstract] A modified finite adaptive switching algorithm was developed which ensures attainment of the control objective with given accuracy in tracking the programmed movement. The adaptive switching algorithm derived, which

stabilizes nonlinear objects of control, is suitable for a dynamic object of any order, and the state vector and its time derivatives can enter into the equation of the object in any fashion. It is only necessary to select the proper number of target functions and the number of switching events in the adaptive algorithm. References 2: Russian.  
[444-6900]

CSO: 1862

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